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APPLICATION FOR LETTERS PATENT
UNITED STATES OF AMERICA

I, Klaus **JANSEN**, a citizen of Germany, residing at Stralsunder Weg 8, 21614 Buxtehude, Germany, have invented certain new and useful improvements in a

METHOD FOR DETERMINING ATOMIC ISOTOPE MASSES

of which the following is a specification.

This patent application is the Unites States Patent Cooperation Treaty (PCT) Chapter II National Phase of International Application No. PCT/EP03/04523, having an International Application Date of 30 April 2003, designating the United States of America, which in turn claims priority on German Patent Application No. 20207055.7, having a filing date of 3 May 2002, and German Patent Application No. 20209330.1, having a filing date of 15 June 2002.

TECHNOPROP COLTON LLC
PO Box 567685
Atlanta GA 31156-7685

Tel: 770.522.9762
Fax: 770.522.9763
Email: technoprop@technoprop.com

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SPRUNG SUPPORT, PARTICULARLY FOR A MATTRESS

STATEMENT OF RELATED APPLICATIONS

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BACKGROUND OF THE INVENTION

1. Technical Field

The invention relates to a supportive spring base for, in particular, a mattress for a place to sleep and/or recline having a plurality of spring slats running at a parallel distance to one another, and having longitudinal struts which run transversely with respect to the spring slats and belong, in particular, to a frame, the spring slats being mounted with their end regions on the longitudinal struts.

The supportive spring base discussed here is an elastic and/or resilient support for mattresses or similar means of padding beds, bunks, couches, armchairs or the like.

2. Prior Art

Various supportive spring bases of the abovementioned type are known. The supportive spring bases differ substantially in their spring characteristic. The spring characteristic has a decisive influence on the degree of comfort when sleeping or reclining exhibited by the beds, couches or the like which are provided

with a supportive spring base of this type. Further differences between the known supportive spring bases are found in their production costs.

The invention is based on the object of providing a supportive spring base for, in particular, a mattress for a place to sleep or recline, which provides a high degree of comfort when sleeping, reclining or sitting and nevertheless can be produced cost-effectively.

BRIEF SUMMARY OF THE INVENTION

A supportive spring base for achieving this object has a plurality of spring slats running at a parallel distance to one another, and longitudinal struts which run transversely with respect to the spring slats and belong, in particular, to a frame, the spring slats being mounted with their end regions on the longitudinal struts, characterized by connecting elements for connecting at least two spring slats in each case. Accordingly, provision is made for the connecting elements of the supportive spring base to be designed in such a manner that they connect at least two spring slats in each case to one another. Whereas it was previously customary to mount all of the spring slats independently of one another, the invention now goes down another route by the independent mounting and therefore the isolated spring behavior of the individual spring slats being intentionally removed by the spring slats being connected to one another by means of the connecting elements. The connecting elements serve in this manner not only to influence, in particular to increase, the spring properties of the supportive spring base but also the connecting elements connect individual spring slats to one another.

Provision is furthermore made for the connecting elements to be of at least partially elastic design. If they are not elastic, rigid or quasi-rigid properties are obtained. Connecting elements comprising flexurally slack ropes or straps were only suitable for transmitting tensile forces between adjacent spring slats; by contrast, it is possible for the connecting elements according to the invention, on

account of them being of elastic design, to transmit at least part of the movement of the particular spring slat to at least one adjacent spring slat. In particular, the elastic properties of the connecting elements make it possible, at least in part, to transmit a vertical movement of a particular spring slat to at least one adjacent spring slat in such a manner that the latter likewise executes a vertical movement. The connecting elements therefore provide a comprehensive intercoupling of the spring slats by a type of bridge formation. The consequence is that not only do individual spring slats change their shape when subjected to a load, in particular sag, which could result in a discontinuous profile for the supportive spring base, but also, the coupling together of the spring slats by means of the connecting elements, which are of elastic design according to the invention, results in the sagging of individual spring slats being transmitted to the other spring slats, as a result of which the supportive spring base undergoes a continuous, steady change in shape. A "sliding" transition between adjacent spring slats may also be spoken of.

In one preferred refinement of the supportive spring base according to the invention, provision is made for the connecting elements to be mounted on at least two different spring slats. This provides a preferably elastic or partially elastic connection of the spring slats. In this case, the connecting elements form bridges between the spring slats that affect, but eliminate the cushioning properties of the spring slats. Preferably, one connecting element in each case is arranged between two adjacent, parallel spring slats. Two spring slats are therefore coupled to each other in each case by means of at least one connecting element, with a plurality of connecting elements usually being arranged between two adjacent spring slats. A multiple coupling of adjacent spring slats to one another therefore takes place. At the same time as the spring slats are coupled to one another by the connecting elements the connecting elements are also mounted on the spring slats. Two essential functions of the supportive spring base according to the invention are therefore linked to each other, this substantially contributing to the capability of producing the supportive spring base according to the invention at reasonable cost. In order to assist the overall

function, the connecting elements may be provided with additional springs which allows the spring characteristic of the overall system to have a flatter profile in the lower-load range.

According to one advantageous refinement of the invention, which may also involve an independent solution of the object on which the invention is based, the connecting elements may be formed from at least one spring element, at least one load-bearing means and/or suspension devices for connecting the connecting elements to the spring slats. The spring elements impart independent spring properties to the connecting elements. For this purpose, the spring elements are preferably designed as spring bellows, as spring plates or as elastic wings. The load-bearing means serve to hold the spring elements, which impart elastic properties to the connecting elements, between two adjacent spring slats in each case. The load-bearing means can be of entirely or substantially rigid design. The remaining parts of the connecting means then ensure that the spring slats are elastically connected. However, it is also possible for the load-bearing means and the spring elements to be of elastic design, in which case the spring properties of the load-bearing means preferably differ from those of the spring elements.

According to a further independent solution of the object mentioned at the beginning, which may also be a development of the supportive spring base, provision is made for the connecting elements to be mounted on the spring slats in such a manner that the connecting elements are movable both in a rotational and also translational manner relative to the spring slats – or vice versa. The translational mobility of the spring slats with respect to the connecting elements leads inter alia to it being possible to change the distances of the spring slats from one another in spite of the spring slats being connected by the connecting elements. The rotational movement between the spring slats and the connecting elements makes it possible, for example, for the connecting elements to sag in the center without the connecting elements as a result having to rotate the spring slats about their longitudinal axis. The aforesaid rotational and translational mobility of the connecting elements with respect to the spring slats results in the spring slats

not being stiffened owing to them being connected by the connecting elements. Nevertheless, the coupling of the spring slats to one another by the connecting elements – even if the coupling is elastic – results in the movement behavior, in particular the bending behavior or cushioning behavior, of the spring slats being influenced in a specific way.

The suspension devices for connecting the connecting elements to the spring slats are preferably assigned to ends of the load-bearing means. The suspension devices serve primarily for mounting the connecting elements on the spring slats, in particular for attaching the connecting elements to the spring slats. However, the suspension devices preferably also have a further task: by means of an appropriate formation of the suspension device, in particular an elastic design of the same, the suspension devices can in fact be rotated in relation to the spring slats, specifically preferably about the longitudinal axis of the particular spring slat. However, the suspension devices additionally also permit a translational mobility, specifically preferably transversely with respect to the longitudinal direction of the spring slats. As a result, the suspension devices of the connecting elements do not form a rigid connection of the spring slats which would result in the spring slats losing the resilient, namely elastic, properties. Rather, the suspension devices make it possible for the spring slats to be deformed in a defined manner, namely to behave in a resilient manner, the connecting elements and, in particular, their suspension devices leading to defined coupling properties for the spring slats. Similarly, the suspension devices make it possible for the connecting elements to be able to move independently of the spring slats, in particular resilient deformations of the connecting elements independently of the spring slats are possible. In spite of the suspension devices permitting elastic deformations with a plurality of degrees of freedom between the connecting elements and the spring slats, their elastic design ensures that adjacent spring slats are coupled to one another, as desired by the invention, in particular that all of the spring slats are interlinked, as a result of which independent movements of the individual spring slats are intentionally removed and instead the movements of the individual spring slats are transmitted to adjacent spring slats in a certain manner, but to such an

extent that a rigid connection of the spring slats is not produced.

According to one preferred development of the invention, which may also constitute an independent solution of the object mentioned at the beginning, at least one suspension device of the connecting elements is assigned at least one locking device which fixes the particular connecting element nondisplaceably in the longitudinal direction of at least one spring slat. The locking devices are preferably designed in such a manner that they hold the particular connecting element nondisplaceably in the longitudinal direction of the particular spring slat in a frictional and/or non-positive manner. Locking devices of this type render superfluous profilings on the spring slats for the nondisplaceable fixing of the connecting elements along the spring slats or a construction of the connecting elements in such a manner that they support one another over the entire width and therefore reduce the outlay on manufacturing a material.

According to a further refinement of the invention, provision is made to form the connecting elements from elongate strands. The elongate strands extend over a plurality of spring slats, preferably all of the spring slats, and form a coupling of the spring slats that has an influence on the spring properties of the spring slats in such a manner that a loading or compressive deflection of a certain spring slat is transmitted to at least one adjacent spring slat by the connecting elements, specifically, in particular, also strands. In the very simplest case, all the spring slats can be connected to a single strand. The formation of the connecting elements from strands constitutes a particularly cost-effective measure for realizing the invention, namely the coupling together of the spring slats.

The strands, preferably a plurality of strands, run in a horizontal plane defined by the spring slats, or parallel hereto. However, the direction of the longitudinal axes of the strands points way from the direction of the longitudinal axes of the spring slats. The strands preferably run perpendicularly or in a transverse direction with respect to the spring slats. However, it is also conceivable to allow the strands to run obliquely with respect to the spring slats,

specifically either at an acute or an obtuse angle. In this case, the individual strands situated next to one another preferably run in parallel.

The strands may have an identical elasticity behavior or bending behavior throughout. However, it is also conceivable to change the elasticity of the strands, in particular in all or selected regions between consecutive spring slats, by means of inserts or attachments, to be more precise preferably in such a manner that the strands become stiffer at the points concerned. The attachments may be stiffening means which are releasably connected to the strands, for example by means of a snap connection or by bonding, for example by sticking them on. The attachment may thus also be formed from (short) strand sections. The strand sections may be formed from the same material as the strands themselves.

According to one development of the invention, the strands are connected by transverse strands. A net is then produced, so that the preferably integral net interlinks the connecting element, specifically all of the connecting elements. A net of this type can be produced in a particularly simple manner. In addition, the net can easily be placed on the spring slats with the strands in the desired profile. The strands cannot slip when attached to the spring slats. The transverse strands, which extend in the longitudinal direction of the spring slats when strands run at right angles to spring slats, can serve, when arranged over the spring slats, to connect the net and therefore the strands to the spring slats.

The strands and, if appropriate, also the transverse strands, i.e. the entire net, are formed from a material of defined flexural rigidity. As a result, the spring slats can be coupled together by the strands or the net, so that the movements, in particular sagging, of the spring slats affect one another without the spring slats thereby being connected rigidly to one another.

The net additionally provides the possibility of fastening both local stiffening means for the connection and also for variously distributed springs or spring elements. The springs or spring elements distributed as desired over the surface

of the net provide an additional spring mounting of a support, in particular a mattress, arranged on the supportive spring base. The springs or spring elements can be clipped onto longitudinally or transversally directed strands of the net. The springs or spring elements are preferably situated at junction points of the net where a particularly favorable snap connection of the spring or spring elements to the net is possible. The springs or spring element preferably have supports with a large surface area, in particular spring disks. These result in a distribution of the load under the support or mattress, with the result that local indentations are avoided.

It is furthermore possible to enweave the spring slats into the net. This enables a simply, but permanent connection of the net to the spring slats to be produced. The spring slats are preferably threaded over their entire length or only selected regions through the meshes of the net.

Furthermore, the use of the elastic net or else of the connecting elements of defined elasticity makes it possible to design the supportive spring base in a manner such that it can be rolled up and therefore transported in a space-saving manner. The elastic properties of the net or of the other connecting elements which are not net-like not only permit the supportive spring base according to the invention to be rolled up in a simple and space-saving manner; what is more, the supportive spring base inevitable returns into its planar position after being unrolled.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred exemplary embodiments of the invention are explained in greater detail below with reference to the drawing, in which:

FIG. 1 shows a perspective illustration of part of a supportive spring base,

FIG. 2 shows a perspective illustration of a detail from FIG. 1 with a few

connecting elements,

FIG. 3 shows a cross section through two adjacent spring slats with a connecting element connecting them,

FIG. 4 shows a plan view of two adjacent spring slats and part of a connecting element connecting them,

FIG. 5 shows an alternative refinement of the invention in an illustration analogous to FIG. 2,

FIG. 6 shows a further exemplary embodiment of the invention in an illustration analogous to FIG. 2, and

FIG. 7 shows an alternative refinement of the supportive spring base according to the invention with a net-like connecting element.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The supportive spring bases, which are only shown in part in the figures, serve as a support for, for example, a mattress (not shown) of a bed or else of a bunk or a couch.

The supportive spring base has a plurality of preferably identically designed spring slats 10. The individual spring slats 10 run parallel to one another at a distance. The distances between adjacent spring slats 10 may be identical, but also may differ from one another in some regions. All of the spring slats 10 preferably lie in a common, horizontal plane, but may also be in a different plane or on a slope in some regions, for example in the head region.

The spring slats 10 are mounted at opposite ends on two parallel longitudinal struts 11. The longitudinal struts 11 extend in the longitudinal

direction of the supportive spring base or of the mattress arranged thereon. By contrast, the spring slats 10 run transversely with respect to the longitudinal struts 11 (FIG. 1). The longitudinal struts 11 are preferably connected to one another by transverse struts (not illustrated), so that the longitudinal struts 11 are part of a preferably rigid, rectangular frame.

The spring slats 10 are connected at their opposite ends to the longitudinal struts 11 by bearing bodies 12 (illustrated only by way of intimation in FIGS. 1 and 7). The bearing bodies 12 usually serve to connect the ends of the spring slats 10 elastically or in an articulated manner to the longitudinal struts 11. However, a rigid connection of the ends of the spring slats 10 to the longitudinal struts 11 is also conceivable in the supportive spring base according to the invention.

According to the invention, the spring slats 10 are (additionally) connected to one another in the region between the longitudinal struts 11. This additional connection takes place only by means of connecting elements. FIGS. 2 to 7 show different exemplary embodiments of entirely or partially elastic or semi-rigid connecting elements which automatically return to the original form after a compressive deflection, the connecting elements shown in FIGS. 2 to 6 connecting two adjacent spring slats 10 in each case to each other or coupling them together. The connecting elements couple the relevant spring slats 10 together. As a result, the spring slats 10 act in the manner of a spring surface which is continuous over the entire surface of the supportive spring base. Local compressive deflections of the spring slats 10 and the resulting discontinuous profile of the supportive spring base with locally defined depressions are thereby avoided. The connecting elements result in local deformations of individual spring slats 10, in particular vertical compressive deflections of the spring slats 10, being transmitted to adjacent spring slats 10. Adjacent spring slats 10 therefore participate, to be more precise preferably only in part, in the compressive deflection of individual spring slats 10. As a result, even when individual spring slats 10 are subjected in particular to perpendicular loads, this produces a steady, continuous transition to adjacent spring slats 10 and therefore a deformation of

the same which is distributed uniformly over the surface of the supportive spring base.

FIGS. 2 to 4 illustrate connecting elements 13 which have spring elements which are designed as wings 14. The two wings 14, which are of identical design, are assigned to opposite sides of a load-bearing means 15 of the connecting element 13 or 31. The elongate, strip-like load-bearing means 15 extends between two adjacent, consecutive spring slats 10. The load-bearing means 15 extends transversely with respect to the longitudinal direction of the spring slats 10, specifically from one spring slat to the adjacent spring slats 10.

Opposite ends of the load-bearing means 15 are in each case assigned a suspension device 16. The suspension devices 16, which are identical in FIG. 3, serve to connect the particular connecting element 13, i.e. the load-bearing means 15 having the wings 14, to the particular spring 10. The exemplary embodiment of FIG. 4 shows the connecting element 31 in which different suspension devices 16 and 18 are provided.

The wings 14 on opposite sides of the load-bearing means 15 have approximately rectangular base areas. The wings are profiled in a direction extending parallel to the longitudinal direction of the spring slats 10, specifically in such a manner that the wings 14 increasingly extend towards their free transverse edges 17 over the horizontal plane defined by the spring slats 10. The wings 14 thereby partially protrude with respect to the horizontal plane of the spring slats 10.

An independent invention is to be seen in the design in particular of the suspension device 16. FIG. 4 shows the connecting element 31 with different suspension devices 16 and 18. The suspension device 16, which is shown on right in FIG. 4, has two identical claws 19 having an approximately semicircular cross section. The claws 19 engage around the upper half of the spring slat 10 which is likewise approximately circular in cross section in the exemplary

embodiment shown. The two claws 19 which are spaced apart from each other in the longitudinal direction of the spring slat 10 are connected integrally to a spring section 20 which is likewise part of the suspension device 16. The spring section 20 shown comprises two parallel springs 21 which are formed from a respective elastic material strip which has a meandering profile, and, in particular in the exemplary embodiment shown, corresponds to an entire (full-circle) sinusoidal oscillation. The two springs 21 are of identical design and are arranged in mirror-inverted fashion on opposite sides of a longitudinal center axis 22 (running transversely with respect to the longitudinal direction of the spring slats 10) of the particular connecting element 31. The relative arrangement of the springs 21 is undertaken in such a manner that the sinusoidal profile of the springs 21 is in a horizontal plane defined by the spring slats 10. Those ends of the springs 21 of the spring section 20 which are directed away from the claws 19 are connected integrally to the corresponding end of the load-bearing means 15.

The suspension device 18 (FIG. 4) of the connecting element 31, which suspension device lies opposite the suspension device 16, is designed like the suspension device 16 with regard to the spring section 20 and the springs 21, in particular is also elastically deformable. The sole change is that just a single claw 23 adjoins the spring section 20 on the outside. This claw 23 has a cross section which corresponds to the claws 19 of the suspension device 16. The width of the claw 23 corresponds to the overall width of the two separate claws 19 of the suspension device 16. In this case, the clear distance between the two separate claws 19 of the suspension device 16 is selected in such a manner that it is somewhat larger than the width of the claw 23 of the suspension device 18. This makes it possible to connect adjacent spring slats 10 to connecting elements 31 lying on a common longitudinal center axis 22, each spring slat 10 being assigned a suspension device 16 of the one connecting element 31 and a suspension device 18 of an adjacent connecting element 31. In this case, the wider claw 23 of the suspension device 18 of the adjacent connecting element 31 engages in the intermediate space between the claws 19 of the suspension device 16 of the one connecting element 31, as indicated by a chain-dotted line in FIG. 4.

The special meandering design of the spring sections 20 of the suspension devices 16 and 18 results in the connecting elements 31, specifically in particular the wings 14 of the same, being movable in relation to the spring slats 10 in a plurality of directions, in particular with a plurality of degrees of freedom. The connecting elements 31 and wheels 14 are preferably movable in a manner such that they spring back elastically in relation to the spring slats 10.

At least a rotational movement and a translational movement of the connecting elements 31 or wings 14 in relation to the particular spring slat 10 are possible. This mobility is obtained by the special meandering design of the spring sections 20 of the suspension devices 16 and 18, but also by the relative arrangement of the springs 21 with respect to the longitudinal axis of the spring slats, on the one hand, and with respect to the longitudinal center axis 22 of the particular connecting element 31, on the other. The translational movement of the connecting element 31 with respect to the spring slats 10 can take place in such a manner that the connecting elements 31 can move along their longitudinal center axis 22 towards the spring slat 10 and away from it. However, the translational movement may also take place in such a manner that the wings 14 and, if appropriate, the load-bearing means 15, but not the suspension devices 16 and 18, can move and/or deform elastically in the longitudinal direction of the spring slats 10. Finally, the connecting element 31 (or at least parts of the same) can also move to a small extent perpendicularly with respect to the horizontal plane of the supportive spring base that is defined by the spring slats 10. However, the cushioning properties of the connecting element 31 perpendicular with respect to the horizontal plane are harder than in other directions because of the special relative arrangement of the springs 21.

In the case of the connecting element 31 shown in FIG. 4, the (right-hand) suspension device 16 is assigned two locking devices 24. The locking devices 24, which are of identical design, are assigned to opposite outer sides of the claws 23, specifically in such a manner that a small intermediate space 25 remains

between the outer wall of the particular claw 23 and the inner wall, directed towards the latter, of the particular locking device 24.

Each locking device 26 has a narrow claw 26 which is of semicircular design and extends over the upper half of the particular spring slat 10. A projection 27 is arranged at opposite, lower ends of the semicircular profile. The projection 27 is designed to correspond to a corresponding longitudinal groove 28 of the particular spring slat 10. The projections 27 of the claws 26 engage in the longitudinal grooves 28, with the result the claws 26 of the locking devices 24 are snapped onto the spring slat 10 in such a manner that they cannot be rotated about the longitudinal axis of the spring slat 10.

Each claw 26 is connected integrally to the corresponding end of the load-bearing means 15 of the connecting element 31 by a dedicated, narrow spring section 29. Like the spring sections 20 of the suspension devices 16 and 18, the spring sections 29 have a meandering profile. However, each spring section 29 is formed only from a single spring 30 which likewise has a complete (full-circle) sinusoidal profile. The springs 30 of the locking devices 24 are rotated through 90° with respect to the springs 21 of the suspension devices 16 and 18. In the exemplary embodiment shown, the springs 30 are arranged in such a manner that their sinusoidal profile extends in a vertical plane which runs transversally with respect to the longitudinal axis of the particular spring slat 10. The springs 30 are therefore rotated with respect to the springs 21 through 90° about the longitudinal center axis 22 of the connecting element 31. This arrangement of the springs 30 of the locking devices 24 means that the springs 30 do not significantly affect the mobility of the connecting elements 31, and in particular of the wings 14, in relation to the spring slats 10.

The springs 30 of the locking devices 24 serve to prevent the particular connecting element 31 from being displaceable in the longitudinal direction of the spring slats 10. If namely a force which acts along the spring slats 10 is exerted on the connecting elements 31, this results in the locking devices 14, in particular

the claws 26 on the spring slats 10, being inclined, as a result of which the locking devices 24 are twisted in the longitudinal direction of the spring slats 10 and prevent further displaceability of the connecting element 31 in the longitudinal direction of the spring slats 10. In this case, it suffices if – as in the exemplary embodiment of FIG. 4 – two opposite locking devices 24 are assigned to just one suspension device 16. This ensures that the connecting elements 31 according to the illustration in FIG. 4 are connected consecutively on a common longitudinal center axis 22 to two spring slats 10 in each case. If such a consecutive arrangement of the connecting elements 31 is not necessary or not desired, the connecting elements 31 can have identical suspension devices 16 on each side, and two locking devices 24 in each case. This symmetrically constructed connecting element 13 is illustrated in FIG. 3. FIG. 2 shows the manner in which such connecting elements 13 having identical suspension devices 16 and locking devices 24 on both sides are arranged offset in a consecutive arrangement between different pairs of spring slats 10 in each case.

In one exemplary embodiment (not shown) of the supportive spring base, the connecting elements 13 or 31 are arranged situated one behind another in a row and are also connected to one another, i.e., as it were interlinked. The connection of the connecting elements 13 or 31 takes place at the suspension devices 16 or 18. Identical suspension devices 16 or 18 are preferably provided for connected connecting elements 13 or 31. Suspension devices 18 without locking devices 24 are sufficient because the connection or interlinking means that the connecting elements 13 or 31 cannot so easily be displaced longitudinally in relation to the spring slats 10. However, it is also entirely possible for suspension devices 16 with locking devices 24 to be provided. The interlinking of the connecting elements 13 or 31 means that only one suspension device 16 or 18 is ever required between two adjacent connecting elements 13 or 31 in each case. Two adjacent connecting elements 13 or 31 in each case are therefore connected to a respective spring slat 10 by a common suspension device 16 or 18. The interlinking of the connecting elements 13 or 31 gives rise in each case to a type of strap with a plurality of interconnected connecting elements 13 or 31 which

extend preferably continuously over the entire length of the supportive spring base element. The direction of longitudinal extent of the strap extends transversely with respect to the spring slats 10, it being possible for a plurality of parallel straps to be provided. The interconnected connecting elements 13 or 31 connect more than two spring slats 10, preferably all of the spring slats 10, to one another. An appropriately pliable design of the suspension devices 16 or 18 means that the latter act “in an articulated manner”. In this case, the joints formed by the suspension devices 16 and 18 of appropriately pliable design rest on the spring slat 10. In this manner, deformations of an individual connecting element 13 or 31 are not transmitted or not significantly transmitted to the adjacent spring element 13 or 31. The spring properties of the interconnected, interlinked connecting elements 13 or 31 therefore correspond approximately to the spring properties of the individual connecting elements 13 or 31, as is shown in FIGS. 2 to 4. It is alternatively also conceivable to connect, in particular to interlink, the connecting elements 13 or 31 in the longitudinal direction of the spring slats 10.

FIG. 5 shows elastic or partially elastic connecting elements 32 according to another exemplary embodiment of the invention. The connecting elements 32 of identical design are arranged offset next to one another and consecutively between two spring slats 10 in each case in order to bridge the same. The spring elements of the connecting elements 32 are designed as bellows 33. Each connecting element 32 has a bellows 33. The bellows 33 can be deformed elastically, namely can be compressed, by either the air contained in the bellows, which is sealed in an airtight manner, being compressed or by the bellows being ventilated, so that its spring properties are determined solely by the deformability of the cylindrical wall of the bellows 33. The bellows 33 of each connecting element 22 is connected to two parallel, elongate, load-bearing means 34 which extend transversely with respect to the longitudinal direction of the spring slats 10. Suspension devices which can correspond to the suspension device 16 or else to the suspension device 18 of the exemplary embodiment of FIGS. 2 to 4 are arranged at opposite ends of the two load-bearing means 34. All or else only some of the suspension devices 16 and/or 18 are in turn assigned locking devices

24 which secure the particular connecting element 32 against displacements in the longitudinal direction of the spring slats 10.

The arrangement of the connecting elements 32 that is shown in FIG. 5 permits all of the suspension devices 16 or 18 at the ends of the connecting elements 32 to be of identical design. In principle, however, it is also possible to assign different suspension means 16 or 18 to the load-bearing means 34 and to provide only some of the suspension devices 16 or 18 with one or more locking devices 24.

FIG. 6 shows a connecting element 35 which differs from the connecting element 32 of FIG. 5 only by it having two bellows 36 preferably of identical design. The bellows 36 follow one another in a direction running transversally with respect to the spring slats 10. The load-bearing means 37 is designed in such a manner that it serves to receive the two consecutive bellows 36. The suspension device and the locking device in the case of the connecting element 35 are designed in the manner as has been described in conjunction with the connecting elements 13, 31 and 32. In this case too, different alternatives with regard to the design and arrangement of the suspension device 16, 18 and the locking device 24 are conceivable.

In place of the bellows 33 and 36, the connecting elements 32 and 35 may also be provided with other spring elements, for example disk-like springs, corrugated surfaces or the like.

According to an alternative refinement (not shown) of the invention, the connecting elements 32 and 35 may also be designed such that they are interconnected in at least one row running transversely with respect to the spring slats 10. Two suspension devices 16 which are situated at a short distance next to each other in the longitudinal direction of a spring slat 10 then serve in each case to connect two adjacent connecting elements 32 and 35. As a result, the connecting elements 32 and 35 are also situated one behind another interlinked in

a row, the respective row running transversely with respect to the spring slats 10. All the connecting elements 32 and 35 are interconnected in a strap-like manner in the particular row and, as a result, connect more than two spring slats 10, preferably all of the spring slats 10. The suspension devices 16 for connecting adjacent connecting elements 32 and 35 serve for the articulated coupling together of the connecting elements 32 and 35 which follow one another in the longitudinal direction of the supported spring base. It is also conceivable, instead of the suspension devices 16, to use the suspension devices 18 (shown in FIG. 4) without a locking device 24 in order to interlink consecutive connecting elements 32 and 35 of each row of connecting elements 32 and 35. The connecting elements 13 and 31 can additionally or alternatively also be used in rows running longitudinally with respect to the spring slats 10.

FIG. 7 shows a supportive spring base having a single connecting element 37. In the exemplary embodiment shown, the connecting element 37 is designed as a net 38. The net 38 extends approximately over the entire area defined by the spring slats 10, in particular an at least partially horizontal plane. The net 38 has a plurality of longitudinally directed strands 39 running transversally with respect to the spring slats 10, and transverse slats 40 running along the spring slats 10 and/or parallel to the spring slats 10. It least the strands 39 are of spring-elastic design and they accordingly behave in a similarly resilient manner to the spring slats 10. The strands 39 or else the transverse strands 40 have a softer spring characteristic than the spring slats 10. In the exemplary embodiment shown, all of the strands 39 and also all of the transverse strands 40 run parallel to one another, with the transverse strands 40 extending perpendicularly with respect to the strands 39. However, it is also conceivable for some of the strands to run antiparallel and for the transverse strands 40 not to extend perpendicularly with respect to the strands 39. It is also possible for at least the strands 39 to run at an angle of less than 90° with respect to spring slats 10.

In the exemplary embodiment shown, some of the transverse strands 40 extend centrally over each spring slat 10. At those points at which the transverse

strands 40 run over the spring slats 10, the net 38 is connected to the spring slats 10. In the exemplary embodiment shown, this takes place by means of preferably releasable clamps 41 (only illustrated by way of intimation). The distribution of the clamps 41 over the surface of the supported spring base 30 shown in the figures is to be understood as only one possible example. In actual fact, the clamps 41 may be fixed at virtually all desired points, specifically in a positioning and number sufficient to couple the spring slats together with the net 38. Instead of the clamps 41, it is also possible for other connecting means for coupling together the spring slats 10 to the transverse strands 40 or, if appropriate, also to the longitudinal strands 39 to be used. These connecting means may be designed in such a manner that they connect the net 38 resiliently to the spring slats 10. The elasticity of the supportive spring base shown in FIG. 7 then comes about by means of the elasticity of the net 38 as such and the elastic connection of the net 28 to the spring slats 10. Furthermore, the supportive spring base is also elastically and resiliently flexible by means of a deformation of the spring slats 10.

As an alternative, it is conceivable to connect the net 38 to the spring slats by enweaving. To do this for example, the spring slats 10 are made to pass in alternating fashion from above and below through adjacent loops of the net 38. With this type of connection of the net 38 to the spring slats 10, the clamps 10 can be omitted.

The net 38 is preferably formed from plastic, in particular thermoplastic. The strands 38 and the transverse strands 40 are of such a thickness that they are still flexible, in particular can be deformed elastically. The transverse strands 40 are connected to the strands 39 at the crossing points, specifically preferably integrally during the production of the net 38. It is conceivable to provide the strands 39 and/or the transverse strands 40 of the net 38 with reinforcements, in particular tensile strands. These tensile strands may be formed, for example, from high-tensile fibers, such as glass fibers, carbon fibers or the like. Although this type of reinforcement allows the strands 39 and/or transverse strands 40 to retain their elastic properties, the extensibility of the strands 39 and/or transverse

strands 40 is lower, as a result of which effective coupling of the spring slats 10 to one another is brought about.

The strands 39, 40 of the net 38 may also be designed in such a manner that their elasticity changes in the longitudinal direction. For this purpose, the strands 39 preferably have a higher degree of stiffness between the spring slats 10. This higher degree of stiffness can be brought about by a thicker cross section of the strands 39 between the spring slats 10, specifically, for example, by short strand sections which are glued or clipped onto the strands 39 in regions between spring slats 10.

The net 38 may also be provided with additional spring elements (not shown in the figures). These may be, for example, disk springs which form a relatively large supporting surface for a mattress or the like. The disk springs are connected preferably in a snap-fitting manner either to the strands 39 or the transverse strands 40. However, the disk springs may also be snapped onto the net 38 at the crossing points.

It is alternatively also conceivable to form a net from connecting elements 13, 31, 32 and/or 35 connected or interlinked longitudinally and transversally with respect to the spring slats 10.

All of the above-described, elastic connecting elements permit the supported spring base to be rolled up, specifically with spring slats 10 running parallel to one another. Particularly suitable for a supportive spring which can be rolled up is one in which the connecting elements are formed by the net 38.

The remaining connecting elements 13, 31, 32 and 35 are preferably formed integrally from plastic, in particular thermoplastic. However, it is also conceivable to form the load-bearing means 15 and 34 from a different material than the remaining parts of the connecting elements 13, 31, 32 and 35. In such a case, the connecting elements 13, 31, 32, 35 are of multipart design. The

formation of the load-bearing means 15 and 34 from a different material or a material having different properties makes it possible to design the load-bearing means 15, 34 to be stiffer than, in particular, the spring elements, for example wings 14 or bellows 33, 36 of the connecting elements 13, 31, 32 and 35.

Whereas the net 38, according to FIG. 4, which is arranged on the spring slats 10 involves a uniform coupling of the spring slats 10 to one another over the entire surface of the supportive spring base, it is possible, when individual connecting elements 13, 31, 32 and 35 are used, to distribute these connecting elements nonuniformly over the surface of the supportive spring base, specifically in a manner which meets requirements. However, if the need arises, the connecting elements 13, 31, 32, and 35 may also be distributed uniformly over the surface of the supportive spring base. Finally, it is also conceivable to combine different connecting elements 13, 31, 32 and/or 35 with one another by the particular connecting elements being assigned as required to certain points on the supportive spring base.

List of reference numbers

10	spring slat
11	longitudinal strut
12	bearing body
13	connecting element
14	wing
15	load-bearing means
16	suspension device
17	transverse edge
18	suspension device
19	claw
20	spring section
21	spring
22	longitudinal center axis
23	claw
24	locking device
25	intermediate space
26	claw
27	projection
28	longitudinal groove
29	spring section
30	spring
31	connecting element
32	connecting element
33	bellows
34	load-bearing means
35	connecting element
36	bellows
37	connecting element
38	net
39	strand

40 transverse strand

41 clamp